

IN THE CLAIMS

1–8. (Canceled)

9. (Original) A pacemaker, including:

a battery power terminal for a pacemaker battery;

a capacitor electrically connected to the battery power terminal;

pacemaker control circuitry electrically connected to the battery power terminal and the capacitor for controlling current flow from the battery power terminal to the capacitor to charge the capacitor and to discharge the capacitor to a discharge voltage level (V_d) before beginning a time charge measurement; and

charge time measurement (CTM) control circuitry electrically connected to the pacemaker control circuitry and adapted to:

access a predetermined set of charge time measurement set-up parameters
and a predetermined elective replacement time (ERT) charge time
limit associated with an AC impedance target for the battery;

determine a rate of charge storage in the capacitor using the
predetermined set of charge time measurement set-up parameters;
and

declare an ERT using the determined rate of charge storage in the
capacitor and the ERT charge time limit,

wherein the predetermined set of charge time measurement set-up parameters to be
accessed by the CTM control circuitry include:

a final voltage (V_F) to end the charge time measurement for determining
the rate of charge storage in the capacitor; and

an initial reference voltage (V_I) to begin the charge time measurement for determining the rate of charge storage in the capacitor, V_I being greater than V_d .

10. (Original) The pacemaker of claim 9, wherein the pacemaker control circuitry includes comparison circuitry for comparing a battery terminal voltage (V_{batt}) to a brownout voltage limit (V_{stop}), and for comparing a capacitor voltage (V_{cs}) to one of the predetermined set of charge time measurement set-up parameters.

11. (Original) The pacemaker of claim 10, wherein the pacemaker control circuitry further includes a switched capacitor power supply operably connected to the battery power terminal and the capacitor for charging the capacitor, wherein an output of the comparison circuitry is electrically connected to the switched capacitor power supply to control current flow from the battery power terminal to the capacitor.

12. (Original) The pacemaker of claim 9, wherein the pacemaker control circuitry controls current flow to the capacitor to increase a capacitor voltage (V_{cs}) approximately linearly from V_I to V_F during the time measurement for determining the rate of charge storage in the capacitor.

13. (Previously Presented) The pacemaker of claim 9, wherein:

the CTM control circuitry includes a multiplexer for selecting one of V_F and V_I to be compared to a capacitor voltage level (V_{CS}) within the pacemaker control circuitry; and

the CTM control circuitry is adapted to select V_I to be compared to V_{sc} to begin a time charge measurement and V_F to be compared to V_{CS} to end the time charge measurement.

14. (Original) The pacemaker of claim 9, wherein the CTM control circuitry includes a time charge counter for measuring a time in which a relatively constant current charges the capacitor from V_I to V_F .

15. (Original) The pacemaker of claim 9, wherein the pacemaker control circuitry includes a sensing and pacing control block adapted for selecting VI.
16. (Previously Presented) The pacemaker of claim 9, wherein the CTM control circuitry includes a multiplexer for selecting one of the VF, VI and Vd to be compared to a capacitor voltage level (V_{CS}).
17. (Previously Presented) The pacemaker of claim 16, further comprising:
a capacitor discharge switch;
a bypass capacitor connected across the battery power terminal; and
means to provide a brown out voltage limit;
wherein the CTM control circuitry is adapted to compare:
Vd to V_{CS} to limit the discharge of the capacitor and open the capacitor discharge switch;
VI to V_{CS} to begin a time charge measurement after the bypass capacitor (C_b) is discharged and a battery terminal voltage (V_{batt}) is driven to the brownout voltage (V_{stop}) limit; and
VF to V_{CS} to end the time charge measurement.
18. (Original) The pacemaker of claim 9, wherein the VF is programmable by a physician.
- 19–20. (Canceled)
21. (Original) A system, comprising:
a battery power terminal for a battery;
a capacitor electrically connected to the battery power terminal;
means to control current flow from the battery power terminal to charge the capacitor;
means to access a predetermined set of charge time measurement set-up parameters and a predetermined elective replacement time (ERT) charge time limit associated with an AC

impedance target for the battery, the predetermined set of charge time measurement set-up parameters including:

- a charged voltage reference (VF) to end a charge time measurement for determining the rate of charge storage in the capacitor;
- an initial voltage reference (VI) to begin the charge time measurement for determining the rate of charge storage in the capacitor; and
- a discharge voltage reference (Vd) to which the capacitor is discharged prior to beginning the time measurement for determining the rate of charge storage in the capacitor, Vd being less than VI;

means to determine a rate of charge storage in the capacitor using the predetermined set of charge time measurement set-up parameters;

means to compare the determined rate of charge storage in the capacitor to the predetermined ERT charge time limit for the predetermined set of charge time measurement set-up parameters; and

means to declare an ERT based on a number of comparisons between the determined rate of charge storage in the capacitor and the ERT charge time limit.

22. (Original) The system of claim 21, wherein further comprising:

means to calculate an AC impedance of the battery using the determined rate of charge storage and the predetermined set of charge time measurement set-up parameters; and

means to determine the ERT charge time limit using the AC impedance of the battery.

23. (Original) The system of claim 21, further comprising:

a table containing relationships between a number of AC impedances for the battery and a number of rates of charge storage;

means to perform a table look-up using the table and the determined rate of charge storage to determine the AC impedance of the battery; and

means to determine the ERT charge time limit using the AC impedances.

24. (Original) The system of claim 21, further comprising means to display charge remaining in the battery.

25. (Original) The system of claim 24, wherein the programmer circuitry includes means to graphically display the charge remaining in the battery.

26. (Original) The system of claim 21, further comprising means to estimate a time until the ERT is declared.

27. (Previously Presented) The pacemaker of claim 9, wherein the CTM control circuitry includes:

a memory; and

means for loading the memory with a pacing voltage amplitude value to function as the charged voltage reference (VF), an initial value to function as the initial voltage reference (VI), and a discharge value to function as the discharged voltage reference (Vd).

28. (Previously Presented) The pacemaker of claim 9, wherein the pacemaker battery is a lithium battery.

29. (Previously Presented) The system of claim 21, wherein the means to determine a rate of charge storage in the capacitor includes:

means to compare a voltage across the storage capacitor (V_{CS}) to the discharge voltage reference while discharging the storage capacitor to the discharge voltage reference;

means to compare V_{CS} to the initial voltage reference while charging the storage capacitor, and to initiate the measuring of the charge time for the storage capacitor when V_{CS} reaches the initial voltage reference; and

means to compare V_{CS} to the charged voltage reference while charging the storage capacitor to the charged voltage reference, and ending the measuring of the charge time for the storage capacitor when V_{CS} reaches the charged voltage reference.

30. (Previously Presented) The system of claim 21, wherein the battery is a lithium battery.